

L Number	Hits	Search Text	DB	Time stamp
1	1	("6330346").PN.	USPAT; US-PGPUB	2002/03/05 13:18
4	85	infrared same spectrometer same (tissue or skin or iris or eye)	USPAT; US-PGPUB	2002/03/05 13:19
7	10	(infrared same spectrometer same (tissue or skin or iris or eye)) and (identif\$9 or verifi\$ or recogni\$9).ab.	USPAT; US-PGPUB	2002/03/05 13:39
10	2	TOPPING-ALANSON-D TOPPING-ALLEN	USPAT; US-PGPUB	2002/03/05 13:45
13	6	("4236082"   "4614366"   "4785171"   "4856891"   "4881268"   "5359669").PN.	USPAT; US-PGPUB	2002/03/05 13:45
16	1073	("382/115-127").CCLS.	USPAT; US-PGPUB	2002/03/05 13:46
19	0	((("382/115-127").CCLS.) and spectromet4er	USPAT; US-PGPUB	2002/03/05 13:46
22	2	((("382/115-127").CCLS.) and spectrometer	USPAT; US-PGPUB	2002/03/05 13:46
25	12	("3811116"   "4142601"   "4592443"   "4613845"   "4641349"   "4725824"   "4728939"   "4953111"   "4978303"   "4996151"   "4997770"   "5291560").PN.	USPAT; US-PGPUB	2002/03/05 13:47

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8	768	((spectra or spectrum or spectrometer) same (subcutaneous or skin or tissue or epidermis)) same infrared	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2002/03/05 17:02
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29	10	((spectra or spectrum or spectrometer) same (subcutaneous or skin or tissue or epidermis)) same infrared) and (recogni\$9 or identif\$9 or verif\$9).ti.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2002/03/05 17:12
36	45883	(spectra or spectrum or spectrometer) and (subcutaneous or skin or tissue or epidermis)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2002/03/05 17:02
43	9344	((spectra or spectrum or spectrometer) and (subcutaneous or skin or tissue or epidermis)) and infrared	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2002/03/05 17:02
50	35	((spectra or spectrum or spectrometer) and (subcutaneous or skin or tissue or epidermis)) and infrared) and biometric\$6	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2002/03/05 17:02
57	1926	(recogni\$9 or identif\$9 or verif\$9) with infrared with spectr\$2	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2002/03/05 17:13
64	63	((recogni\$9 or identif\$9 or verif\$9) with infrared with spectr\$2) and (comparison) with (stored or reference or template)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2002/03/05 17:22
71	8	biometric\$8 and (spectra or spectrum or spectrometer)	EPO; JPO; DERWENT	2002/03/05 17:31
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78	2	("382/115-127").CCLS.) and infrared and spectrometer	USPAT; US-PGPUB	2002/03/05 17:32
81	53	("382/115-127").CCLS.) and infrared and spectr\$2	USPAT; US-PGPUB	2002/03/05 17:32

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4	0	OTT-JAMES-H and infrared	USPAT; US-PGPUB	2002/03/05 17:53
7	10	OTT-JAMES-H and (light or illuminat\$4)	USPAT; US-PGPUB	2002/03/05 17:55
10	1	("6343140").PN.	USPAT; US-PGPUB	2002/03/05 18:03
13	1	("5793881").PN.	USPAT; US-PGPUB	2002/03/05 18:04
16	1	("4,932,776").PN.	USPAT; US-PGPUB	2002/03/05 18:04

L Number	Hits	Search Text	DB	Time stamp
3	212	("382/115").CCLS.	USPAT; US-PGPUB	2002/03/05 11:24
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9	1	"4728186".PN.	USPAT; US-PGPUB	2002/03/05 09:51
12	0	6330346.URPN.	USPAT; US-PGPUB	2002/03/05 09:52
15	6	("4336998"   "4358677"   "4394773"   "4492958"   "5719950"   "5737439").PN.	USPAT; US-PGPUB	2002/03/05 09:53
18	356	("250/339.1,341.8").CCLS.	USPAT; US-PGPUB	2002/03/05 11:25
21	559	("250/339.07,559.44,316.1").CCLS.	USPAT; US-PGPUB	2002/03/05 11:25
24	13	((("250/339.1,341.8").CCLS.) and spectrum and (identification or recogintion or verification ) and (skin or tissue or subcutaneous)	USPAT; US-PGPUB	2002/03/05 11:31
27	5	((("250/339.07,559.44,316.1").CCLS.) and infrared and spectr\$2 and (identification or recogintion or verification ) and (skin or tissue or subcutaneous)	USPAT; US-PGPUB	2002/03/05 11:34
30	3	((("382/115").CCLS.) and infrared and spectr\$2 and (skin or tissue or subcutaneous)	USPAT; US-PGPUB	2002/03/05 11:34

09/415,594

# United States Patent

Wunderman et al.

Patent Number: 6,122,042  
Date of Patent: Sep. 19, 2000

## DEVICES AND METHODS FOR OPTICALLY IDENTIFYING CHARACTERISTICS OF MATERIAL OBJECTS

Inventors: Irwin Wunderman, 685 Eureka Ave., Mountain View, Calif. 94040-3875; Adolph E. Smith, 502 Moore Creek Rd., Santa Cruz, Calif. 95060-2345; Vijay K. Lumba, 5077 Bays Ct., San Jose, Calif. 95148

App. No.: 08/885,561  
Filed: Jul. 1, 1997

Related U.S. Application Data  
Provisional application No. 60/039,308, Feb. 7, 1997.  
Int. Cl. G01N 11/00  
U.S. Cl. 356/73; 356/343  
Field of Search 356/73; 356/343

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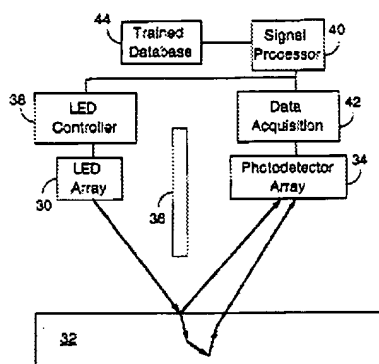
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Primary Examiner—Frank G. Font  
Assistant Examiner—Reginald A. Ratliff  
Attorney: Agent, or Firm—Lumen Intellectual Property Services

## ABSTRACT

An apparatus for photometric analysis and/or identification of properties of a material object comprises a collection of light sources having substantially distinct wavelengths, a detector and a signal processor. The apparatus comprises a collection of spatially distributed light detectors which detect radiation from the object and produce detected signals. A signal processor for controlling the light sources and analyzing the detected signals synchronizes the detected signals with the activation of the sequence of distinct combinations of the light sources to produce associated combinations of detected signals which are then analyzed to determine a physical property of the object and/or compared for similarity to previously detected signals from known objects. The photometric data may be combined and correlated with other measured data to enhance identification.

66 Claims, 18 Drawing Sheets



US-PAT-NO: 6122042  
DOCUMENT-IDENTIFIER: US 6122042 A

TITLE: Devices and methods for optically identifying characteristics of material objects  
DATE-ISSUED: September 19, 2000

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	RULE
Wunderman, Irwin	Mountain View	CA	94040-387	N/A	N/A
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Lumba, Vijay K.	San Jose	CA	95060-234	N/A	N/A
			5		
			95148		

APPL-NO: 6/ 886561  
DATE FILED: July 1, 1997

## PARENT-CASE:

CROSS-REFERENCE TO RELATED APPLICATIONS The present application claims priority from provisional patent application 60/039,308 filed Feb. 7, 1997, which is incorporated herein by reference. The present application is related to disclosure document No. 800093 deposited Aug. 22, 1995.

INT-CL: [7] G01N021/00

US-CL-ISSUED: 356/73, 356/343  
US-CL-CURRENT: 356/73, 356/343

FIELD-OP-SEARCH: 356/73; 250/343

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ART-UNIT: 287

PRIMARY-EXAMINER: Font, Frank G.

ASSISTANT-EXAMINER: Ratliff, Reginald A.

ATTY-AGENT-FIRM: Lumen Intellectual Property Services

## ABSTRACT:

An apparatus for photometric analysis and/or identification of properties of a material object comprises a collection of light sources having substantially

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